

**B. TECH.**  
**(SEM-I) THEORY EXAMINATION 2019-20**  
**ENGINEERING CHEMISTRY**

Time: 3 Hours

Total Marks: 100

Note: Attempt all questions if you are unable to do so satisfactorily.

**SECTION A**

- 1. Attempt the questions briefly** **2 x 10 = 20**
- What is copolymerization? Give two examples.
  - Write the difference between Homopolymer and Copolymer.
  - Discuss the classification of Fuels.
  - Explain Frenkel defect with diagram.
  - Explain hardness of water.
  - State the significance of triple point.
  - Why is a block magnesium attached through an insulated metallic wire to an underground pipeline.
  - Why is graphite used as lubricant?
  - Define the term chromophores and Auxochrome, in U.V. spectroscopy.
  - Write the electrode reaction of galvanic cell.

**SECTION B**

- 2. Attempt any three of the following:** **10 x 3 = 30**
- What do you understand by temporary hardness and permanent hardness of water? Describe the Zeolite process for removal of hardness from water.
  - What are composites? Give their classification and applications.
  - With the help of Molecular orbital diagram explain why NO molecule is paramagnetic.
  - What is Portland cement? Give the chemical reaction involved during setting and hardening of Cement.
  - What is Lambert's Beer's law in UV visual spectroscopy? Also, explain the role of TMS in NMR spectroscopy.

**SECTION C**

- 3. Attempt any one part of the following:** **10 x 1 = 10**
- Explain the process of scale and sludge formation in boilers. How can this be prevented?
  - A water sample contains  $\text{CaSO}_4 = 16.2 \text{ mg/l}$ ,  $\text{Mg}(\text{HCO}_3)_2 = 29.2 \text{ mg/l}$  and  $\text{CaSO}_4 = 13.4 \text{ mg/l}$ . Calculate temporary, and permanent hardness. Convert the ans in ppm, degree clark, degree french.
- 4. Attempt any one part of the following:** **10 x 1 = 10**
- Describe construction and working of Galvanic cell with the help of diagram?
  - Calculate temporary hardness from the following data from the soap titration method, when 50 ml of water is titrated with soap solution :
    - Lather factor = 0.3 ml soap solution
    - total hardness = 9.3 ml soap solution
    - permanent hardness = 3.1 ml soap solution
    - Standard hardness water ( $200 \text{ mg/L}$  of  $\text{CaCO}_3$ ) = 18.3 ml.

5. Attempt any one part of the following: 10 x 1 = 10

- a) What is organ metallic compound? Give the reaction of  $\text{CH}_3\text{CH}_2\text{MgBr}$  with  $\text{CO}_2$ ,  $\text{SO}_2$ ,  $\text{CS}_2$ ,  $\text{CH}_3\text{COCH}_3$  and  $\text{CH}_3\text{OH}$ .
- b) Define phase rule. Apply phase rule to water system.

6. Attempt any one part of the following: 10 x 1 = 10

- a) Calculate the cost of lime and soda required for softening 1 million litres of water containing  
 $\text{Mg}(\text{HCO}_3)_2 = 73\text{mg/l}$ ,  
 $\text{MgSO}_4 = 120\text{ mg/l}$ ,  
 $\text{CaSO}_4 = 68\text{ mg/l}$ ,  
 $\text{CaCl}_2 = 111\text{ mg/l}$ .  
The cost of lime of 80% purity is Rs200 per metric tone and that of soda of 90% purity is Rs 12,000 per metric tonne.
- b) How do you prepare the following polymers:  
(i) Bakelite (ii) Dacron (iii) SBR (iv) NBR (v) Nylon 6

7. Attempt any one part of the following: 10 x 1 = 10

- a) Define the term Chromospheres and Auxochrome in UV spectroscopy.  
An organic Compound having molecular formula  $\text{C}_7\text{H}_6\text{O}$  shows absorption peaks at 3010, 2700, 1600, 1580, 1520, 1480, and 1270  $\text{cm}^{-1}$  in its IR spectrum. Suggest its structure
- b) Explain reverse osmosis. 100 ml of water sample has hardness equivalent of 12.5 ml of 0.08 N  $\text{MgSO}_4$ . What is its hardness in ppm?

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